IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

SEOUL SEMICONDUCTOR CO., LTD.; and SEOUL VIOSYS CO., LTD.,	)	1:24-cv-579
Plaintiffs,	)	
v.	)	
TECHNICAL CONSUMER PRODUCTS, INC.,	)	
Defendant.	)	

MEMORANDUM ORDER

This patent-infringement case concerns patents involving LED technology. The parties have briefed a number of disputes regarding claim construction; and the Court held a *Markman* Hearing on December 4, 2025, to hear argument on six of the more significant disputed terms.[1]

After careful consideration of the parties' briefs, the patents, the intrinsic evidence, and any specific extrinsic evidence that is noted in this order, the Court resolves the disputes, as follows:

Dispute No. 1

Disputed term	Seoul's Proposal	TCP's Proposal	The Court's Construction
"low-doped layer"	Plain and ordinary meaning; Alternatively:	Indefinite;[2] Alternatively:	Plain and ordinary meaning

[1] In a joint letter to the Court, the parties grouped the disputes for the hearing into seven different terms. ECF 125. It's more accurate to say "six disputes," as several of the disputes involve multiple related terms.

[2] This is not intended to be a finding on the question of indefiniteness as to these '800 Patent terms. Rather, TCP's indefinite arguments are more suited for resolution on a developed record at summary judgment or trial. *See Sensormatic Elecs., LLC v. Genetec (USA) Inc.*, No. CV 20-760 (MN), 2021 WL 4453594, at *4 (D. Del. Sept. 29, 2021) (declining to rule on the indefinite issue and allowing defendant to re-raise the issue at summary judgment).

'800 Patent: claims 1, 6, 7, 14, 17, 19,	• a semiconductor layer containing a dopant wherein the dopant concentration is less than a dopant concentration of the at least one intermediate doped layer (Claim 1) • a semiconductor layer containing a dopant wherein the dopant concentration is less than that of the doped layer (Claim 14)	"a layer having a dopant concentration less than 1x1018/cm3"	
"intermediate doped layer" '800 Patent: claims 1, 7, 8	Plain and ordinary meaning; "semiconductor layer containing a dopant, which is located between the first and second low-doped layers"	Indefinite; "a layer located between the first and second low doped layers and having a dopant concentration from 1×1018/cm3 to 1×1020/cm3"	Plain and ordinary meaning
"doped layer" '800 Patent: claims 14–17, 19, 20	Plain and ordinary meaning; "a semiconductor layer containing a dopant"	Indefinite; "a layer having a dopant concentration from 1×1018/cm3 to 1×1020/cm3"	Plain and ordinary meaning

Dispute 2

Disputed term	Seoul's Proposal	TCP's Proposal	The Court's Construction
"undercut sidewall" '967 Patent: claims 17 & 20	a sidewall having a structure consistent with material having been cut away from the underside so as to leave an overhanging portion in relief	"sidewall(s) located inwardly on the underside of an upper overhanging portion of a body"	A sidewall having a structure consistent with material having been cut away from

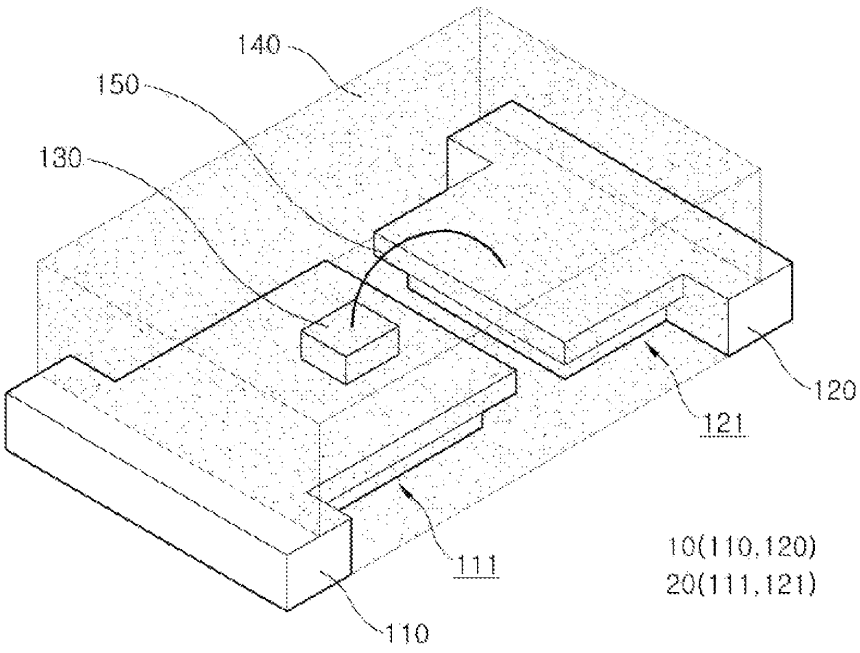
			the underside so as to leave an overhanging portion in relief
"fixing space" '967 Patent: claims 17 & 20; '821 Patent: claims 1, 2, 5	Plain and ordinary meaning for both patents; For the '967 Patent: "a space that includes the area under the overhangs of the undercut sidewalls" For the '821 Patent: "outer fixing space": "a space that includes the area under the overhang of the [inset sidewall]" "inner fixing space": "an opening extending from the first surface to the second surface"	"opening perforating and/or formed through a body in a vertical direction (i.e., a direction normal to the surface of a light-emitting diode chip)"	An opening extending from the first surface to the second surface
"fixing hole" '967 Patent: claims 17 & 20; '821 Patent: claim 5	Plain and ordinary meaning for both patents; For the '967 Patent: "a hole located in the interior portion of a lead frame" For the '821 Patent: "inner fixing space"	"opening perforating and/or formed through a body in a vertical direction (i.e., a direction normal to the surface of a light emitting diode chip) and surrounded by the body"	A fixing space that has a closed boundary

The inventions here concern light emitting device designs meant to "enhance adhesive force between a lead frame and a molding unit." Ex. 4 at 1:26-31. To increase the adhesive force, the designs focus on "forming a fixing space through the lead frame and integrally forming the molding unit on the top surface of the lead frame and in the fixing space." *Id.*

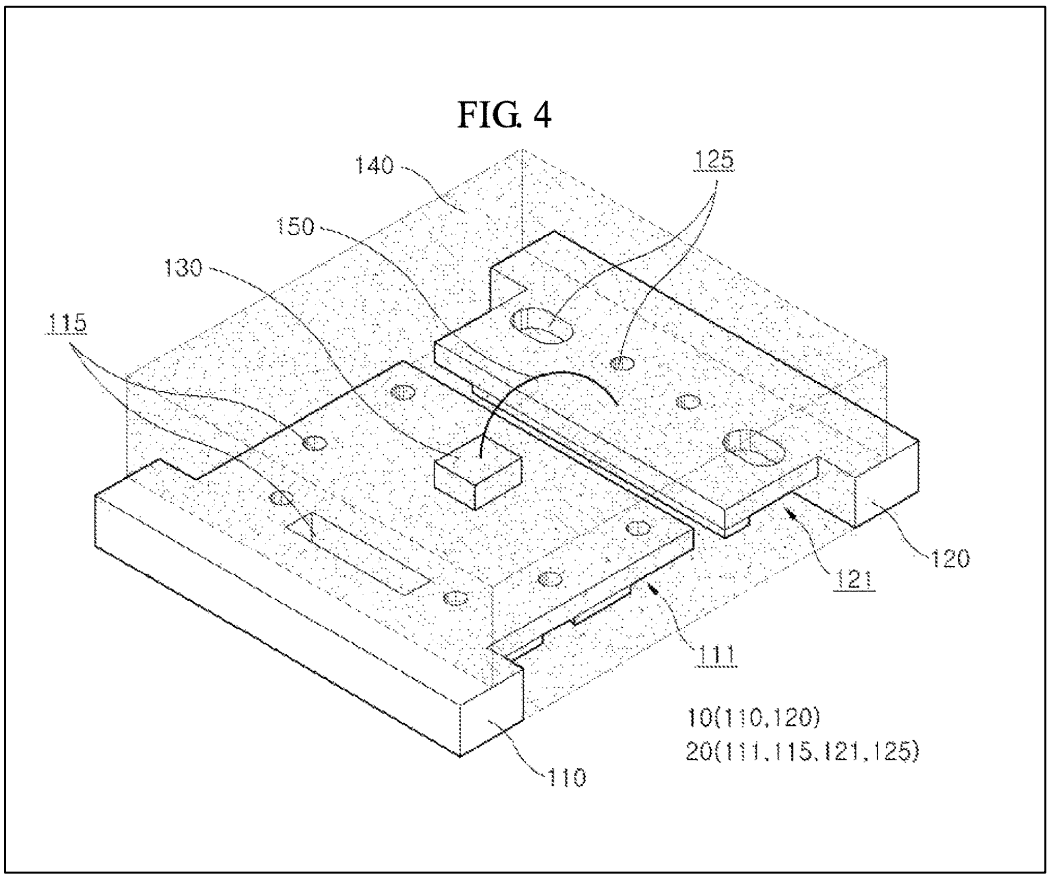
But with this innovation has come limitations. Because of problems with the adhesive force between the molding unit and the lead frames, the LED and enclosed wires "may be damaged by being exposed to air or moisture." *Id.* at 1:59-62. The designs in the '967 Patent and the '821 Patent seek to minimize moisture and air exposure to the wires and LED by improving the adhesive force. How is the adhesive force improved? By structurally designing the lead frames with various indents, holes, and spaces.

The parties' disputes here center on those different indents, holes, and spaces. Figure 1 & Figure 4 below detail two different embodiments of the '967 Patent.[3]

FIG. 1



[3] Both the figures and specification in the '967 Patent and the '821 Patent mirror each other with respect to the current dispute. The Court cites the '967 Patent for reference, but, to be clear, the Court is considering both patents in its analysis.



In Figure 1, the two lead frames (110 & 120) have fixing spaces on the sides of the frame (111 & 121). *Id.* at 3:25-63. Within the fixing spaces are the fixing holes. *Id.* When the manufacturer places the molding unit on top of the frames, the molding resin fills in the fixing spaces and fixing holes, creating a secured adhesive on the top of the lead frames. *Id.*

Figure 4 details much the same as Figure 1, but describes another exemplary embodiment of the '967 patent. In Figure 4, the design is still focused on preventing the molding unit from separating from the lead frame. *Id.* at 4:39-67. Just here, the fixing spaces are modified and include inner fixing holes, too (115 & 125). *Id.*

Based on the above, the Court makes the following three rulings.

First, in construing the term "undercut sidewall," the Court agrees with Seoul and will adopt its interpretation of the term. In doing so, the Court also agrees with

the Patent Trial and Appeal Board's express definition when it considered the same term. *See Satco Prods., Inc. v. Seoul Semiconductor Co., Ltd.*, No. IPR2020-00410, 2021 WL 3123099, at *5–6 (P.T.A.B. July 21, 2021). The Court finds that the Board's definition accurately reflects the invention and is consistent with the description in the '967 Patent.

Second, in construing the terms "fixing space" and "fixing hole," the Court finds that its construction best captures the purpose and meaning of the terms in both patents. The Court agrees with TCP that construing the terms "inner" and "outer" in the '821 Patent as they relate to the fixing spaces and fixing holes is unnecessary. *See* ECF 122 at 53. "Inner" and "outer" are relative to where the spaces or holes are on the lead frames and a jury can understand based on context what either descriptor means. Thus, the Court's construction applies only to the terms "fixing space" and "fixing hole," as TCP suggests.

Third, in reaching its construction, the Court finds that neither parties' proposal best captures the terms' meaning in both patents. As noted in both figures, the location and shape of either a fixing space or hole may change depending on the embodiment. Ex. 4 at 4:39-67. What remains constant among all embodiments in both patents is that where a fixing space does not have a defined boundary on all sides, a fixing hole does. The Court finds that its construction of both terms accurately captures the meaning of both terms, consistent with the intrinsic evidence.[4]

[4] If the parties wish to wordsmith "closed boundary" and have a better and clearer ***agreed-to*** phrase, the Court is open to considering such an alternative.

Dispute 3

Disputed term	Seoul's Proposal	TCP's Proposal	The Court's Construction
"a plurality of thick film layers" '496 Patent: claims 1 & 11	Plain and ordinary meaning; "semiconductor layers each having a thickness greater than the thin film layers"	"a plurality of layers having a thickness between 1.5 nm and 3 nm"	Plain and ordinary meaning
"a plurality of thin film layers" '496 Patent: claims 1 & 11	Plain and ordinary meaning; "semiconductor layers each having thickness not more than a thickness of the thick film layers"	"a plurality of layers having a thickness less than 1.5 nm"	Plain and ordinary meaning

Dispute 4

Disputed term	Seoul's Proposal	TCP's Proposal	The Court's Construction
"a second light emitter comprising at least one light emitting structure" '836 Patent: claim 1	Plain and ordinary meaning; "a structure including at least one light emitting device"	"a second light emitter comprising at least one infrared ray emitter"	a second light emitter comprising at least one infrared ray emitter

The '836 Patent is a design for LED products to better mirror the effects of the sun. Ex. 1 at 1:24-48. To do so, the design seeks to "output light having a spectrum similar to that of the sunlight." *Id.*

The sun emits a wide range of light; some visible, some not. According to one of the '836 Patent's exemplary embodiments, so too would the product. The embodiment would include "a first light emitter configured to emit visible light and . . . a plurality of light sources having color temperatures different from each other" and also "a second light emitter configured to emit infrared rays." *Id.* at 1:59-2:2.

The device would also be designed to "disable the second light emitter" if enough infrared rays were already detected in the area. *Id.* at 2:3-6.

The dispute between the parties is whether the phrase "light emitting structure" is restricted to infrared rays. Seoul argues no; TCP argues yes. The Court agrees with TCP and construes the term to be limited to an infrared ray emitter. Defining the "light emitting structure" here to infrared rays is consistent with the intrinsic evidence. As TCP noted during the hearing, every embodiment within the '836 Patent shows an emitter with visible light and an emitter with infrared rays. *See generally id.* And that makes sense, given the stated purpose of the '836 Patent is to "output light having a spectrum similar to that of the sunlight." *Id.* at 1:24-48.

Dispute 5

Disputed term	Seoul's Proposal	TCP's Proposal	The Court's Construction
"the molding part is made of materials including at least one of silicone, epoxy polymethylmethacrylate (PMMA), polyethylene (PE) and polystyrene (PS)" '933 Patent: claim 15	"the molding part is made of one or more of silicone, epoxy, polymethylmethacrylate, polyethylene and polystyrene"	"the molding part is made of materials including at least one silicone epoxy, at least one polymethylmethacrylate (PMMA), at least one polyethylene (PE) and at least one polystyrene (PS)"	the molding part is made of one or more of silicone, epoxy, polymethylmethacrylate, polyethylene and polystyrene

The dispute here comes down to whether the term at issue is conjunctive or disjunctive. The Court agrees with Seoul and construes the term to be disjunctive.

First, the Court relies on the evidence in the specification where the '933 Patent clarifies that any grouping consisting of terms "X, Y, and Z" can mean "any

and all combinations of one or more" of those terms. Ex. 2 at 4:27-34. Second, the Court relies on Seoul's expert, where he found that a POSITA would understand the molding part would only have to have "at least one of the materials" cited. Ex. 22 at ¶ 53.

Dispute 6

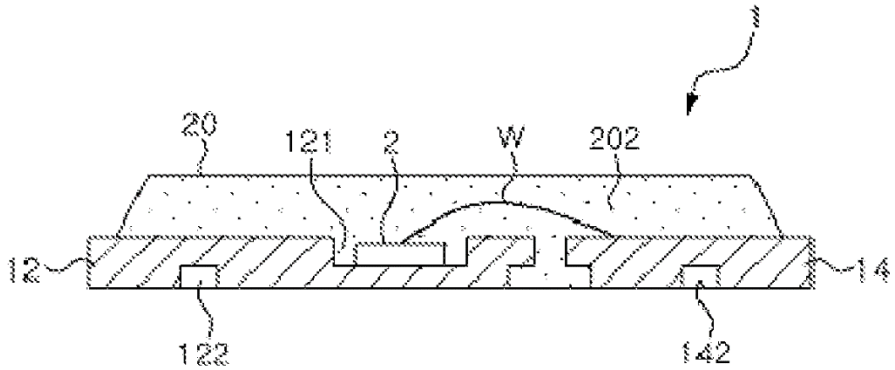
Disputed term	Seoul's Proposal	TCP's Proposal	The Court's Construction
"groove" '050 Patent: claims 1, 2, & 12	Plain and ordinary meaning; "a set of long narrow channels or depressions formed on a lead frame each having a triangular cross-section and filled with resin"	"opening formed in a surface of an object that reduces the thickness of the object within the opening"	opening formed on a lead frame that reduces the thickness within the opening
"sub-groove" '050 Patent: claims 1, 2, & 12	Plain and ordinary meaning; "a set of long narrow channels or depressions formed on a lead frame each having a triangular cross-section and filled with resin"	"opening(s) formed within a groove formed in a surface of an object that reduce(s) the thickness of the object within the opening(s)"	type of groove

The '050 Patent is a design patent that aims to both slim down the LED package while either improving or keeping the same the luminescence efficiency. Ex. 3 at 1:17-21. To reduce the thickness without hurting the lighting efficiency, the invention "allow[s] a transparent encapsulation material to directly support a lead frame without a housing." *Id.* at 1:66-2:4. This general design reduces the overall thickness while also exhibiting "good heat dissipation performance." *Id.*

The dispute here concerns the word "groove," both as a term on its own and as a separate term, "sub-groove." Figure 2 and Figure 8(b) below depict the terms, where

122 and 142 are "grooves" and 122' and 142' are "grooves" made up of "a plurality of sub-grooves." *Id.* at 4:47-50.

Fig. 2



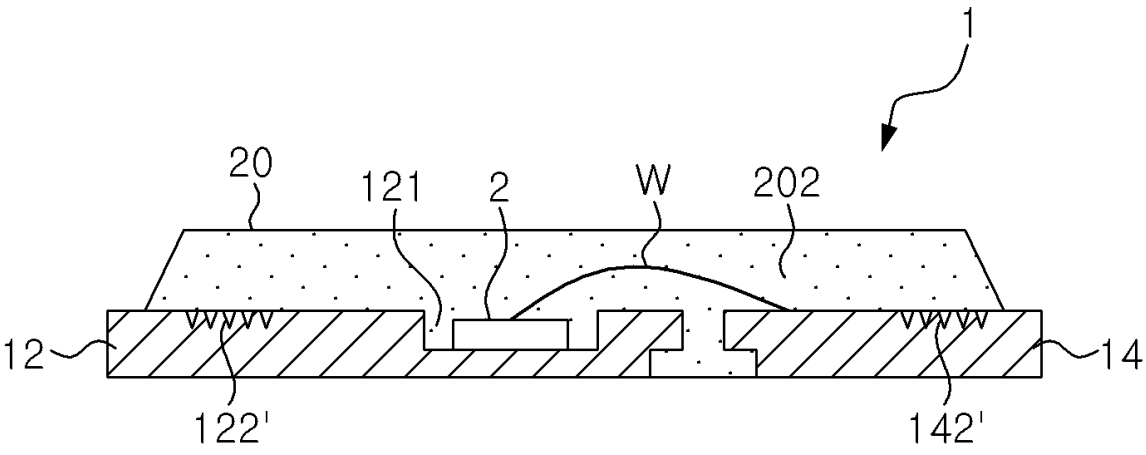


Fig. 8(b)

Consistent with the intrinsic record, the Court finds that the term "groove" must have a broader definition than "a set of long narrow channels," as Seoul suggests. ECF 122 at 39. The Court's construction captures the central function of a groove—to act as an opening and ultimately reduce the overall thickness of the package. Ex. 3 at 1:17-21. Both Figure 2 and Figure 8(b) depict openings, just different types, which the Court's construction recognizes.

As for "sub-groove," the Court finds that the prefix "sub" modifies the meaning of groove to indicate that this is a secondary class of groove, or type of groove. *See sub*, *Merriam-Webster* (10th ed. 1997). Thus, in the context of claim 1, the '050 Patent reads: "the groove comprises a plurality of sub-grooves, each [*type of groove*] having a triangular cross-section." Ex. 3 at 7:10-11 (Court's construction added). Because the claim itself goes on to describe the sub-grooves as having "a triangular cross-section," it is unnecessary to further define sub-groove. The intrinsic record, as well as the claim itself, provide enough clarity for a jury to determine precisely what a sub-groove is with this construction.

Agreed-upon Terms

The parties also agreed upon construction of a number of claim terms, and the Court will adopt those constructions. ECF 122 at 7–8. The terms and constructions are as follows.

Patent	Term	Construction
'800 Patent: claim 1	"wherein the dopant concentration of the first low-doped layer decreases with increasing distance from the intermediate doped layer and then increases with decreasing distance to the p-type contact layer"	the dopant concentration within the first low-doped layer begins at a local high at the intermediate doped layer, falls to a low, and then increases to a local high at the p-type contact layer

'800 Patent: claim 14	"the second low-doped layers include a hole concentration decreasing with increasing distance from the active layer and then increasing with decreasing distance to the doped layer"	the hole concentration within the second low-doped layer begins at a local high at the active layer, falls to a low, and then increases to a local high at the doped layer
'821 Patent: claims 2 & 5	"the resin"	"the resin" in claim 2 refers back to the recitation "a resin portion" as recited in claim 1; "the resin" in claim 5 refers back to the recitation "a resin portion" as previously recited in claim 5
'496 Patent: claim 1	"functional part"	a plurality of active layers stacked in a direction from the n-type semiconductor layer toward the p-type semiconductor layer
'675 Patent: claims 1, 17, 18	"a thickness of the second converter is in a range of 0.07 mm to 1.5 mm"	the second converter is at least 0.07 millimeters thick and no more than 1.5 millimeters thick
'675 Patent: claim 6	"wherein a thickness of the second converter is in a range of 100 um to 1000 um"	the second converter is at least 100 microns thick and no more than 1000 microns thick

'675 Patent: claims 8, 16, 20	"wherein the light emission spectrum of the phosphors of the first converter includes at least one wavelength region where a portion of each light emission spectrum overlaps another light emission spectrum"	the first plurality of phosphors each have an emission spectrum, and those emission spectra overlap
'675 Patent	"half-value width"	full width at half maximum
'314 Patent: claim 5	"wherein the second extension extend toward the first electrode pad and has a curved shape near the first electrode pad"	the second extension extends [from the second electrode pad] in the direction of [the first electrode pad] and curves near the end
'314 Patent: claims 1 and 5	"in contact with"	touching
'967 Patent: claims 17 and 20	"a first undercut sidewall, a second undercut sidewall, and a third undercut sidewall that at least partially define a fixing space and interior portions of the first and second lead frames, the fixing space being formed by the undercut sidewalls of the first lead frame and the second lead frame"	the first and second lead frames each have at least three [undercut sidewalls] having overhangs, with the spaces under the overhangs being a [fixing space] and the region of the lead frames inward from fixing space being interior portions

'967 Patent: claims 17 and 20	"each fixing hole . . . includes an undercut sidewall that envelopes inner bounds of the fixing hole"	the shape of the interior volume within each fixing hole includes an undercut
'821 Patent: claims 1 and 5	at least one of the sidewalls comprising an inset sidewall partially defining an outer fixing space	one or more of the sidewalls contain an overhang, with the space under the overhang being part of an [outer fixing space]

Remaining Disputes

The disputed six terms addressed above were all the focus at the *Markman* Hearing. In addition to these disputes, the parties also briefed six other disputes.[5] After careful review of the briefing of those disputes, the Court sees no benefit to construing those terms at this juncture. Based on the nature of those disputes, including those that relate to the question of indefiniteness, the parties may raise them in the context of any summary-judgment motions. *See Sensormatic Elecs.*, 2021 WL 4453594, at *4.

[5] Specifically:

1. "The light emitting diode of claim 6, wherein the electrode pad is arranged directly on an upper surface of the transparent electrode layer outside of the opening." (U.S. Patent No. 7,982,207, Claim 7)
2. "well layer" (U.S. Patent No. 8,604,496, Claims 1, 4, 9, 13, and 18)
3. "less than or equal to about 40 nm"; "ranges from about 520 nm to 570 nm"; "ranges from about 600 nm to 670 nm" (U.S. Patent No. 10,510,933, Claim 15)
4. "user interface member" (U.S. Patent No. 11,632,836, Claim 1)
5. "wherein one of the plurality of portions of the first extension is disposed between the plurality of portions of the second extension" (U.S. Patent No. 9,929,314, Claim 3)
6. "second semiconductor layer" (U.S. Patent No. 9,929,314, Claims 1 and 5)

SO ORDERED.

DATED this 22nd day of December, 2025.

BY THE COURT:

/s/ *J. Nicholas Ranjan*
United States District Judge